Difficult Weaning From Mechanical Ventilation

Essay Submitted for Partial Fulfillment of Master Degree in Anesthesiology

BY

Mosaad Abdallah Ibrahim Abou El-Nasr

M.B.B.Ch., Faculty of Medicine, Ain Shams University

Supervised BY

63028

📶 // Prof. Dr. Salah El-Din Moustafa El-Halabi

Professor of Anesthesia and Intensive Care Faculty of Medicine - Ain Shams University

Prof. Dr. Ahmed Gamal Eissa

Professor of Anesthesia and Intensive Care Faculty of Medicine - Ain Shams University

Dr. Sherif Wadie Nashed

Lecturer of Anesthesia and Intensive Care Faculty of Medicine - Ain Shams University

> Faculty of Medicine Ain Shams University *** 1998 ***



617-967



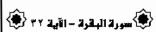




بالبيال المالي المالية

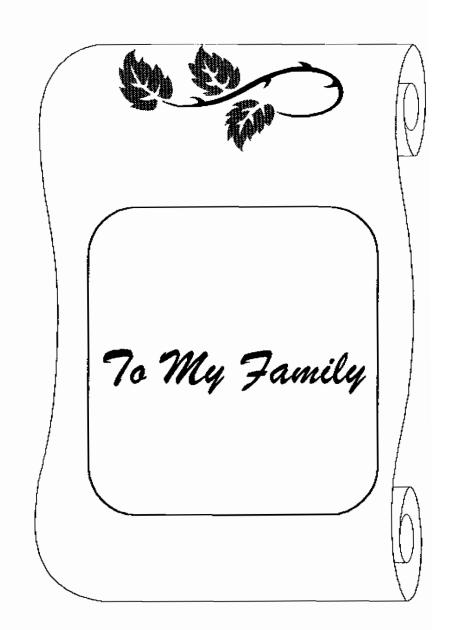
قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم













Acknowledgment

First, thanks are all due to **Allah** for blessing this work until it has reached its end, as a part of his generous help throughout my life.

I would like to direct special thanks to **Prof. Dr. Salah El-Din Moustafa El-Hafabi**, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for the great support and encouragement he gave me throughout the whole work. It is a great honor to work under his guidance and supervision.

I would like to express my sincere gratitude to **Prof. Dr. Ahmed Gamal Eissa**, Professor of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, for his close supervision, continuous help, and the tremendous effort he has done in the meticulous revision of the whole work.

I am greatly honored to express my utmost thanks to **Dr. Sherif Wadie Nashed**, Lecturer of Anesthesia and Intensive Care, Faculty of Medicine, Ain Shams University, from whom I received faithful supervision, valuable suggestions, and continuous guidance throughout this work.

Mosaad Abou El-Nasr





List of Contents

		PAGE
Introduction	1.	1
Chapter 1:	Anatomy of the Ventilatory System.	2 – 9
Chapter 2:	The Physiology of Mechanical Ventilation.	10 – 23
Chapter 3:	Mechanical Ventilation.	24 – 65
	History of mechanical ventilation	24 – 25
	Indications of mechanical ventilation	26 - 27
	Classification of mechanical ventilators	28 - 35
	Modes of mechanical ventilation	36 - 5 0
	Monitoring during mechanical ventilation	51 – 58
	Disadvantages of conventional methods of mechanical ventilation	59 – 65
Chapter 4:	New Non-Mechanical Respiratory Support	
	Therapies.	66 - 74
Chapter 5:	Weaning from Mechanical Ventilation.	75 – 98
Chapter 6:	Difficult Weaning from Mechanical Ventilation.	99 – 112
Summary		113 – 115
References		116 – 133
Arabic Summary		





List of Figures

No.	Figure	Page
Figure (1):	Anatomy of the airway.	2
Figure (2):	Dichotomous division of the airways.	5
Figure (3):	The pulmonary interstitial space.	6
Figure (4):	Spirogram showing static lung volumes.	12
Figure (5):	The relationship between functional residual capacity, closing volume, and closing capacity.	12
Figure (6):	Criteria for determining control variables.	29
Figure (7)	Diagram illustrating the basic principles and nomenclature of ventilator classification.	29
Figure (8):	Criteria for determining phase variables.	30
Figure (9):	Airway pressure tracing in different ventilatory modes.	38
Figure (10):	Schematic of an intermittent mechanical ventilation breathing circuit.	40
Figure (11):	Effect of endotracheal tube resistance on airway and tracheal pressures.	61
Figure (12):	Effect of PSV on breathing pattern.	92
Figure (13):	Probability of remaining on mechanical ventilation in patients with prolonged difficulty in tolerating spontaneous breathing.	93
Figure (14):	Probability of successful weaning using three weaning techniques.	94
Figure (15):	Schematic illustration of a system to provide tracheal gas insufflation.	98





List of Tables

No.	Table	Page
Table (1):	Ventilator mode specifications.	37
Table (2):	Common causes of high airway pressure in mechanically ventilated patients.	53
Table (3):	Common causes of low airway pressure in mechanically ventilated patients.	53
Table (4):	New non-mechanical respiratory support therapies.	67
Table (5):	Standard weaning predictors.	76
Table (6):	Maximum inspiratory pressure.	78
Table (7):	General factors to be optimized before weaning is begun.	83
Table (8):	Indicators that a patient should be returned to mechanical ventilation during weaning.	88
Table (9):	Weaning protocol.	95
Table (10):	Causes of ventilatory pump failure.	101
Table (11):	Causes of left ventricular dysfunction during weaning from mechanical ventilation.	111



